Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Modification of Parts 2 and 15 of the Commission's Rules for unlicensed devices and equipment approval.	)	ET Docket No. 03-201
	)	
	)	

Via the ECFS

COMMENTS OF THE WI-FI ALLIANCE

The Wi-Fi Alliance ("the Alliance")[1] respectfully offers its Comments on the Notice of Proposed Rulemaking (the "NPRM") in the above-captioned Proceeding.

The Alliance and its members are interested parties in this proceeding and we appreciate the opportunity to provide these comments to the Commission.

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[1] The Wi-Fi Alliance, formerly known as the Wireless Ethernet Compatibility Alliance, is an international trade association formed in 1999 with the goal of promoting the adoption and commercialization of IEEE 802.11-compatible products. These products may be used to support Wireless Local Area Networks in the 5 GHz frequency band.
Membership in the Alliance is open to all companies that support the IEEE 802.11x standards. Current members include nearly every major radio manufacturer that produces wireless network equipment for the U.S. market. Alliance membership, with over 200 companies, continues to grow. A complete membership listing may be found on our website, http://www.wi-fi.org.

THE ALLIANCE SUPPORTS THE COMMISSION'S ACTIONS IN THE SUBJECT NPRM TO INTRODUCE ADDITIONAL FLEXIBILITY AND CONSISTENCY IN THE RULES FOR PART 15 DEVICES.

1. In our comments, we will address each of the Commissions proposed changes in accordance with the general outline in the introduction to the NPRM, where the Commission states:

> *"Specifically, in this Notice, we propose to: 1) modify the rules to permit the use of advanced antenna technologies with spread spectrum devices in the 2.4 GHz band; 2) modify the replacement antenna restriction for Part 15 devices; 3) modify the equipment authorization procedures to provide more flexibility to configure transmission systems without the need to obtain separate authorization for every combination of system components; 4) harmonize the measurement procedures for digital modulation systems authorized pursuant to Section 15.247 of the rules with those for similar U-NII devices authorized under Sections 15.401- 15.407 of the rules; 5) modify the channel spacing requirements for frequency hopping spread spectrum devices in the 2.4 GHz band in order to remove barriers to the introduction of new technology that uses wider bandwidths; 6) clarify the equipment authorization requirements for modular transmitters; and 7) make other changes to update or correct Parts 2 and 15 of our rules. In addition, we invite comment on ways the Commission might improve spectrum sharing among unlicensed devices."*[2]

THE ALLIANCE SEES THE NEED FOR A FLEXIBLE APPROACH TO SECTORIZED ANTENNA RULES

2. In changing these rules the FCC must be careful not to set limits based on today's technologies that may restrict future technology developments, and that there is a clear understanding of the benefits and issues with regard to the current technologies. Although both sectorized and/or phased array systems can provide important benefits, solutions allowed by the rules must not be detrimental to other wireless communication devices or future developments.

3. Our own research in this area indicates that, under practical propagation conditions, there is no significant increase in interference area between omni directional systems and single sector antennas or beamforming antennas. Therefore we concur with the proposed changes that allow directional systems to use the same power output rules as point to point systems. In this context the allowance of 8 dB per 120 degree sector for multiple beam solutions may be considered generous but acceptable in view of the fact that such systems can be more spectrally efficient than sectorized and omni-directional antennas.

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2 ET Docket No. 03-201, paragraph 1

4. In section 11 of the NPRM, the Commission asks "*We seek comment regarding the characteristics that a system would need to exhibit in order to be classified as a sectorized or phased array antenna system. "*

- As noted above, research indicates that sector- and beam-type antenna patterns create no larger interference areas than omni directional antenna patterns – provided the transmitter power is kept constant or is slightly decreased with increasing antenna gain. From this point of view there is no reason to define specific characteristics of sector or beam-type antennas. The basic rule that Tx output power should be reduced with 1 dB for every 3 dB that the antenna gain exceeds 6dBi, is adequate. However, the additional "+ 8dB per 120 degree sector" allowance does merit a restrictive definition to avoid misuse. We propose therefore that this allowance be limited to systems employing more than two simultaneous beam type patterns with a half power width of 5 degrees or less. This figure of 5 degrees encourages the design of spectrally efficient narrow beam antenna solutions.

- We are aware that IEEE 802 recommends that classification should be broadened to include future developments (MIMO, Space Time Codes). We consider that our proposal to apply the rule "-1dB for every +3dB above 6 dBi" is adequate to provide additional margin for omni directional systems using such modulation techniques.

- The above comments address only one aspect of unlicensed operation. The Alliance feels that the subject is much more complex and needs to be addressed as part of a broader study of coexistence, both between unlicensed devices and between unlicensed devices and licensed services, e.g. as called out in ET-03-289 (the "interference temperature" Proceeding).

- The Alliance is actively researching the broader area of co-existence and would, be happy to work with Commission and its staff on a more comprehensive study of the issues involved.

THE ALLIANCE RECOMMENDS USING ANTENNA PATTERN AS THE BASIS FOR EVALUATING THE EQUIVALENCE OF REPLACEMENT ANTENNAS RATHER THAN THE PHYSICAL CONFIGURATION OF THE ANTENNA.

5. The NPRM states:

"Any antenna of a similar type that does not exceed the antenna gain of tested antennas may be used without retesting. Use of an antenna of a different type than the tested antenna (i.e. yagi antenna vs. a horn antenna) or one that exceeds the gain of a tested antenna would require retesting and new approval by either a Telecommunication Certification Body or the Commission."[3]

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3 ET Docket No. 03-201, paragraph Appendix A, paragraph 12

6. The Alliance seeks clarification on the use of the term antenna "TYPE" in reference to proposed changes to FCC section 15.203. The NPRM is focused on Access Point considerations while client side radios would be affected by the same rules.

7. In the client radio industry the term antenna "TYPE" can be interpreted by a Telecommunication Certification Body ("TCB") as a different material make up and not necessarily a different antenna pattern as alluded to in this section.

8. The Alliance recommends using antenna family[4] as the basis for evaluating the equivalence of replacement antennas rather than the physical configuration of the antenna. This evaluation method would address both the Access Point and Client market for antenna rules.

THE ALLIANCE FULLY SUPPORTS THE COMMISSION'S EFFORTS TO SIMPLIFY AND HARMONIZE THE RULES FOR POWER MEASUREMENT AS APPLIED TO DIGITAL MODULATIONS

9. We note that the Commission, in the proposed draft text for Part 15 rules in 15.247(e) re: peak power measurement states:

> *"The peak output power and peak power spectral density for digitally modulated system may be determined in accordance with the provisions specified in §§ 15.407(a)(4) and 15.407(a)(5)."*[5]

10. As currently written, the two referenced paragraphs do not clearly spell out measurement procedures for peak power measurement.

THE ALLIANCE RECOMMENDS THAT THE PROCEDURAL CLARIFICATIONS GIVEN BY THE COMMISSION IN DA-02-2138 BE INCLUDED IN THE NEW RULES ON PEAK POWER MEASUREMENT

11. The Commission previously felt the need to clarify the U-NII power measurement rules beyond the texts in 15.407(a)(4) and 15.407(a)(5) by issuing DA-02-2138, "*Measurement Procedure Updated for Peak Transmit Power in the Unlicensed National Information Infrastructure (U-NII) Bands"*, which provides considerable clarification as to the intent of the U-NII band power specifications and the approved measurement methods. For example, DA-02-2138 states

> *"To accommodate this new technology* [specifically, multi-carrier modulation in DA-02-2138, or, as it has evolved, digital modulation in the current 15.247 rules] *peak transmit power may be averaged across symbols over an interval of time equal to the transmission pulse duration of the device or over successive pulses. The averaging must include only time intervals during which the transmitter is operating at its maximum power level and must not*

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4 Reference TCB Training Documents, as presented by the FCC Lab, December 1999.

5 ET Docket No. 03-201, paragraph 1

include any time intervals during which the transmitter is off or is transmitting at a reduced power level."

"Appendix A describes acceptable measurement procedures under this interpretation. Though not required, provision of a continuous transmit mode on devices to be tested will simplify the measurement process."[6]

12. It seems to us that the clarifications in DA-02-2138 are still necessary to support the Commission's intent in this NPRM to implement consistent rules for power measurement in the case of digital modulations. We strongly recommend that the Commission include the substance of the measurement techniques specified in DA-02-2138 within the planned update to Part 15 rules either explicitly in an appropriate section of the rules, or by reference to DA-02-2138 to fully clarify the complex issue of power measurement.

THE ALLIANCE SUPPORTS THE CHANGE IN HOPPING RULES TO ACCOMMODATE THE PROPOSED NEW BLUETOOTH MODULATIONS

13. We understand from the Commission's comments that the Commission proposes to limit this modification to the 2.4 GHz segment in response to the specific change requested by the Bluetooth SIG. We recommend that the Commission adopt this new rule for the following reasons:

A. The 2/3 bandwidth rule increases the number of frequency hopping channels in that can fit into available spectrum for a given 20 dB transmission bandwidth, improving the opportunity for frequency hopping systems to adaptively avoid interfering signals from other systems.

B. Frequency hopping systems using spread spectrum techniques to improve performance in the presences of interference will pay a smaller penalty in terms of the number of available channels compared to the present rules. For example, FSK systems might use a higher than optimum modulation index to reduce their sensitivity to interference from co-channel and intermodulation induced interference, and at the same time have more hopping channels in available under the 2/3 bandwidth rule compared to the present rules.

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6 DA-02-2138A1, August 30, 2002, page 1.

THE ALLIANCE RECOMMENDS ALLOWING THE 2/3 RULE FOR ALL FREQUENCY HOPPING SYSTEMS REGARDLESS OF THE NUMBER OF HOPPING CHANNELS

14. We recommend that the 2/3 bandwidth rule apply to all frequency hopping systems in the 2.4 GHz band operating at an output power no greater than 125 mW, regardless of the number of hopping channels employed, as opposed to the limitations stated in the proposed changes to Part 15.247. The net effect of the 2/3 bandwidth rule is to increase the number of available hopping channels, improving the interference immunity of any frequency hopping implementation. We believe that restricting the rule to systems operating with less than 75 hopping channels denies the benefits of the 2/3 rule to a wider range of systems without any clear benefit to coexistence between different systems.

THE ALLIANCE SUPPORTS THE COMMISSION'S EFFORTS TO MAKE THE MODULAR APPROVAL PROCESS MORE FLEXIBLE

15. We recognize the importance of assuring that devices built with modular components continue to meet all pertinent RF exposure/safety requirements. The Alliance has addressed the RF Exposure issues in our separate filing in ET 03-137.

16. We strongly support the Commission's proposal to codify basic modular approval requirements in § 15.212 "Modular Transmitters" of the Commission's rules, rather than continuing to provide for modular devices exclusively through the Public Notice mechanism.

17. The Alliance requests that the Commission modify and clarify its definition of terms regarding modular transmitters, as outlined in paragraphs 33 and 34 of the NPRM.

18. The radio front end in a partitioned radio architecture is controlled by hardware, firmware, or a combination thereof. Because such systems may contain other firmware, such as host interface drivers and other system functions that have nothing to do with the behavior of the transmitter in terms power and spectral characteristics, we recommend that the term "firmware" be replaced with a different term, perhaps "transmitter control functionality" which is defined to mean those elements that are able to affect the power or spectral characteristics of the RF output.

THE ALLIANCE RECOMMENDS THAT MODULAR APPROVAL BE EXTENDED TO ALLOW TRUE MIX-AND-MATCH COMBINATION OF MODULAR COMPONENTS

19. The concept of modularity put forth by the Commission, namely:

> *"These transmitters consist of two basic components: the "radio front end," or radio elements and the "firmware" or specific hardware on which the software that controls the radio operation resides. The radio front end and firmware can each be self-contained units."*[7]

as stated freezes two "sets of behavior", radio behavior and firmware behavior, and welds them together in terms of compliance requirements. The benefit of the rule seems to be limited to a manufacturer of both sets, or to cooperating manufacturers of these sets. The digital key recognition concept, taken to its logical limits, could allow module interfaces to be defined at a variety of alternative boundaries. This implementation flexibility will encourage technological innovation and allow competitive development to take place.

THE ALLIANCE SUPPORTS THE DIGITAL KEY RECOGNITION APPROACH TO ENSURING ONLY CERTIFIED COMBINATIONS OF MODULAR COMPONENTS ARE FUNCTIONAL

20. In principle, the proposed requirement would facilitate the broader form of modularity advocated in our previous comment. In fact it can be generalized so that an intelligent device that controls the behavior of a radio subsystem can verify that the types of all the modules involved – including the antenna in some case – are all acceptable for the regulation under which it is supposed to operate.

21. Concerning the Type Number and its encryption we suggest that such a type number be sealed with the supplier's secret key (of a public key crypto system) to form an originator's certificate. The processes for generating such keys and signatures are a well established.

22. Additionally, we urge the Commission to adopt an industry standard scheme for device and type numbering. For example, the Type Number could consist of a 4 byte value separated into a 2 byte manufacturer's assigned ID code and a 2 byte device type, as defined in e.g., JEDEC JEP 106.[8]

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[7] ET Docket No. 03-201, paragraph 33

[8] JEP-106 has been in existence for 20 years and has a listing of all the major companies in the industry. For new companies the issuance of a Manufacturing ID is a trivial process involving only a nominal fee.

THE ALLIANCE BELIEVES THAT SPECTRUM SHARING CAN BE ACCOMPLISHED BY A VARIETY OF APPROACHES

23. The issues related to spectrum sharing are complex, as the Commission clearly indicates by the lengthy list of questions it poses in this NPRM regarding spectrum etiquette, as well as the "interference temperature" proceeding and the anticipated "cognitive radio" proceeding.

24. In the most general sense, sharing of spectrum between heterogeneous networks operating under Part 15, or sharing between unlicensed devices and licensed services like broadcast TV, or sharing between unlicensed devices and equipment and systems that have primary allocations for national security reasons can be accomplished either by government regulation and by technologies which promote shared access.

25. Industry groups like the Alliance and standards bodies like IEEE 802 are actively considering a variety of mechanisms to improve the efficiency of spectrum access and sharing, including minimalist spectrum etiquettes.

26. The Alliance believes that, while the Commission needs to strike a balance between rules that manage the efficient sharing of spectrum without being so restrictive as to impede continued innovation, this proceeding and the other proceedings referenced above raise such important issues that we believe it is impractical to adequately address them in the context of this NPRM with its limited (30/45 day) response times.

THE ALLIANCE URGES THE COMMISSION TO MOVE AHEAD WITH RULEMAKING WHICH WOULD SUPPORT UNLICENSED USE OF UNOCCUPIED BROADCAST TV CHANNELS

27. In terms of unlicensed sharing with licensed services, including the possibility of harvesting fallow TV broadcast spectrum, we firmly believe that the sharing mechanism necessary to fully protect the interests of incumbent broadcasters are within the reach of today's technology.

28. We urge the Commission to move ahead with rulemaking which would allow unlicensed systems to operate in otherwise fallow TV broadcast spectrum. Such rules would improve spectrum efficiency and create opportunities for commercial and non-profit utilization of what is currently a largely wasted national asset.

THE ALLIANCE SUPPORTS HP'S REQUEST FOR AN INCREASE IN THE NUMBER OF UNITS THAT MAY BE IMPORTED FOR EVALUATION

29. We support HP in suggesting that the limits on the number of units that can be imported for test and evaluation purposes be increased to 2000, and that the quantity of devices allowed for demonstrations be increased to 100. It seems reasonable to allow the use of demonstration equipment for market development activities outside of trade shows. We also support simplifying the FCC's rules by combining Sections 2.1204(a)(3) and 2.1204(a)(4).

ELIMINATE THE UNIQUE CONNECTOR REQUIREMENT

30. The Alliance recommends and requests that the Commission modify the current 15.203 requirements exclusion list for compliance to include 15.247 and 15.407 devices.

31. As stated in our previous filings the requirement for a "unique connector" is burdensome and serves no useful purpose. There is no such thing as a "unique" connector, as evidenced by the fact that connectors that the Commission once considered "unique" have rapidly become commonly available and the Commission has had to change the list of "unique connectors" over time.

32. This can burden manufacturers with having to make design changes and being stuck with an inventory of connectors that can no longer be used.

33. Furthermore, we do not believe unauthorized antenna replacement to be a significant problem, we note that the Commission is proposing to relax its rules on "mix and match" use of various antennas, and also note that a "unique connector" can easily be circumvented by the small number of users who might be inclined to replace an antenna in violation of the Commission's rules.

ELIMINATE THE INTEGRAL ANTENNA REQUIREMENT

34. Another antenna issue not addressed was the requirement in 15.407(d) for an integral antenna for systems operating under 15.407(a)(1) of the technical rules.

35. As stated in previous filings the requirements for maximum antenna gain, indoor use restrictions and restrictions on transmitter output power are adequate to protect the Mobile Satellite Service (MSS).

Removal of this restriction will allow manufacturers to build one world wide product that can fully utilize the recent ITU-R allocation of the 5 GHz bands instead of forcing manufacturers to increase cost by building one system for US and another system for the world.

TEST METHODOLOGY

The Alliance is considering a proposed test plan for verifying the susceptibility of the interface between partitioned modules to host system noise and will provide its inputs in its Reply Comments.

Respectfully submitted,

/s/
Carl R. Stevenson
Chair, Wi-Fi Alliance Regulatory Committee
4991 Shimerville Road
Emmaus, PA 18049
carlstevenson@agere.com